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(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Optical disc

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Optical disc

FIELD OF THE INVENTION

This invention relates in general to the field of optical discs for storing digital data and more particularly to the field of optical discs for storing both digital data requiring support for defect management and digital real-time audio/video data.

BACKGROUND OF THE INVENTION

Optical discs of today may e.g. be a CD-ROM (Compact Disc Read Only Memory) disc, a CD-R (Recordable) disc, or a DVD (Digital Versatile Disc) for storing digital information. The discs may have different storing capacity and data transfer rates for transferring data to, or reading data from, the disc. Providing audio/video data for real time recording/reading requires a high data transfer rate.

One optical disc supporting real-time recording/reading of audio/video data is the Blu-ray disc. By employing a short wavelength blue violet laser, the Blu-ray disc successfully minimizes its beam spot size by making the numerical aperture (NA) on a field lens that converges the laser 0.85. In addition, by using a disc structure with a 0.1 mm optical transmittance protection layer, the Blu-ray disc diminishes aberration caused by disc tilt. This also allows for better disc readout and an increased recording density. The tracking pitch of the Blu-ray disc is reduced to 0.32 μm, almost half of that of a regular DVD, achieving up to 27 GB high-density recording on a single sided disc.

Because the Blu-ray disc utilizes global standard MPEG-2 transport stream compression technology, it is highly compatible with digital broadcasting for real-time audio/video recording, and a wide range of content can be recorded. It is possible for the Blu-ray disc to record digital high definition broadcasting while maintaining high quality and other data simultaneously with video data if they are received together.

To read/write digital data on an optical disc by a drag and drop functionality, it is preferred that physical defect management in the drive is provided. Thus, the optical disc has to have a dedicated area of the recordable area wherein defect management data may be provided.

The blu-ray video real-time requirements, i.e. 36Megabit/sec read/write and 800msec seek, match the maximum read-write speed of the Blu-ray disc and device. However, the requirements are incompatible with defect management. This means that there is currently no room for the extra delay caused by defect management while playing or recording digital real-time Blu-Ray video data.

In the Blu-ray standard a disc is a single partition containing either a continuous area without defect management or an area with defect management. The standard also requires a certain file system: BDFS (Blu-Ray Disc File System). UDF (Universal Disc Format) is a file system for optical discs. BDFS can not administer as many files as UDF can, which makes BDFS impractical for PC data use, in which tens of thousands of files on a 27GB disc can be expected. BDFS is an integral part of the Blu-ray disc and is highly capable of storing data with real-time requirement. UDF, on the other hand, may be used on a Blu-Ray disc in the PC environment. UDF may be used with a Blu-ray disc, wherein defect management is switched on and can hold tens of thousands of files. The Blu-ray disc standard makes it impossible to have defect management switched on and use it for BDFS at the same time because the logical to physical relationship, i.e. the logical zero point is at a different location of the disc, is different in the two cases. Thus, to meet the conflicting requirements of both reading/writing digital data with support for defect management and read/write real-time audio/video data according to the Blu-ray standard, separate discs have to be provided.

SUMMARY OF THE INVENTION

The present invention overcomes the above-identified deficiencies in the art and solves the above problems by providing an optical disc having a at least two storing areas, which are logically separate.

Accordingly, according to a first aspect of the invention, there is provided an optical disc, wherein a first storing area is dedicated for storing of a first type of digital data,

According to a second aspect of the invention a method for reading digital data from, or writing digital data to, the optical disc is provided. According to the method, the first storing area is accessed by means of a first access means when digital data of the first type are to be read from, or written to, the first storing area. The second storing area is accessed by means of a second access means when digital data requiring defect management are to be read from, or written to, the first storing area.

According to a third aspect of the invention, an optical disc drive comprising an optical reader/writer, a drive controller, means for receiving digital data, and means for receiving an optical disc is provided. The drive controller is adapted to access the first storing area of the optical disc in response to receiving instructions to read a first type of data from, or write the first type of data to, the first storing area. Furthermore, the drive controller is adapted to access the second storing area of the optical disc in response to receiving instructions to read a second type of data from, or write the second type of data to, the second storing area, the second type of data requiring support for defect management.

According to a fourth aspect of the invention, a computer system comprising a disc drive according to the invention is provided. Separate drive-letters within the operating system of the computer may provide separate and independent access to the first and second storing areas of the disc. Alternatively, the first storing area is directly accessible by an application program comprising software readable instructions to access the first storing area.

It is an advantage of the invention that digital data of separate types may be provided on a high-speed and high-capacity optical disc, such as a Blu-ray disc. Furthermore, it is an advantage that digital data incompatible with defect management and digital data requiring defect management support may be stored on the same disc. By providing a disc drive capable of accessing the separate storing areas of the disc in a computer system, the data may be read/written independently by means of the computer system. Another advantage with the invention is that if the storing area dedicated to real-time data is provided as the first storing area of the disc, the disc is compatible with disc recorders known in the art, which do not expect any defect management in the first area.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects, features and advantages of the invention will appear from the following detailed description of the invention, reference being made to the accompanying drawings, in which:

Fig. 1 is a schematic view of a portion of the optical disc according to the invention;

Fig. 2 is a plan view of the optical disc according to the invention;

Fig. 3 is a block diagram of a disc drive connected to a computer system; and

Fig. 4 is a flow chart of a method according to the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

Fig. 1 illustrates in a first embodiment of the invention a schematic view of a section of an optical disc 1. A plan view of the disc 1 is illustrated in Fig. 2. The disc 1 has a first storing area 10, for storing digital data relating to a first type of data. A second storing area 20 is provided for storing digital data relating to a second type of digital data.

As shown in Figs 1 and 2, the disc 1 comprises two physically separate partitions, comprising two logically independent areas. However, the disc may as well comprise more than two partitions as long as at least one area is dedicated for digital data of a first type and at least one area is dedicated for digital data of a second type. The disc 1 has a large storing capacity and a high data transfer rate. Thus, the disc is suitable for storing audio/video data, which may be read from, or written to, the disc 1 in real-time. By adopting a 405 nm blue-violet semiconductor laser, with a 0.85 NA field lens and a 0.1 mm optical transmittance protection disc layer structure, the disc 1 can record up to 27 GB video data on a single sided 12 cm phase change disc. The data transfer rate of the Blu-ray disc is nominally 36 Mbps. The highest transfer rate is only limited by the disc's highest rotational speed and the lowest transfer rate is zero. Thus read/write of real-time data is supported.

According to the invention, the first type of data is digital data having a real-time constraint, such as 36Mbps read/write and 800msec seek, which do not support defect management, e.g. real-time audio/video data. Thus the first type of data may be read/written in real time. The second type of digital data is any type not having any real-time constraint, such as digital data requiring defect management, e.g. data readable/writable by means of a

advantage that either of the storing areas 10, 20 may be provided as the first storing area of the disc 1.

The first storing area 10 comprises a user-data area 11, which has read/write capabilities for high-speed data without defect management. The data recorded in the first storing area are written/read randomly. A track, or a number of consecutively tracks, may be written randomly, hence not continuous. The real-time constraint specifies the minimum size of these tracks to 12 MB, the maximum access time to 800 msec and the nominal read/write rate 36 Mbps.

The second storing area 20 may support defect management in the disc drive, as is preferred for drag and drop support. When used in a computer, a file may be transferred or copied from e.g. the hard disc drive to the optical disc simply be dragging a link in the operating system to a drive letter referring to the second storing area, or vice versa. To support the defect management, the second storing area 20 comprises at least one user-data area 21 and at least one defect management area 22a. In Figs. 1 and 2, also a second defect management area 22b is provided t, wherein the defect management data is divided between them. However, one large defect management area can be provided instead on two.

If two defect management areas are provided one is the "main-data area" and the other area is where the replacements of faulty locations in the main-data area are stored. The defect area with replacement locations can be either continuous or fragmented. The "main-data" area may also be continuous or fragmented. Hence, these two areas may also be interleaved using e.g. Mt Rainier interleaving.

In the user-data area 21 of the second storing area the data are fragmented. Thus, the data may be stored consecutively or randomly on different locations of the user-data area.

The disc 1 is partitioned such that each storing area 10, 20 may be separately and independently accessed. The size of each partition may either be predetermined or determined by the user. Furthermore, the size of each partition may also be changed by the user by studying the BDFS and UDF file system by means of a software tool, such as Partition Magic from Norton Utilities. Such a software tool may re-allocate the partitions if needed and change the boarder position of the two partitions. The partitions are each addressed logically by the user. Each partition can be viewed as two separate discs, wherein each partition has a logical zero. Alternatively, each partition has its own address space, wherein the first space starts at zero and has maximum M-1 addresses 0<=M<=22..27GB)

and the second address space starts at M and goes to N-1(N is the size of the disc: 22..27GB, i.e. 0<=M<=N<=22..27GB).

Fig. 3 is a schematic diagram of a disc drive 30 according to the invention. The disc drive 30 comprises means for receiving 36 a disc 1 when it is inserted into the drive 30. The drive 30 also comprises means for rotating the disc (not shown), such as an electrical motor, and means for optically read/write the digital data 31, such as an optical pick-up, to transfer data to/from the disc 1. A digital signal processor (DSP) 32 may be provided to process the data received from, or transmitted to, the read/write means 31.

The DSP 32 may e.g. comprise a controller for controlling the motor, a demodulator, one or several memories, such as a RAM (Random Access Memory) and a ROM (Read Only Memory), a defect management controller for executing defect management, and an interleaver/deinterleaver.

A drive controller 33 is adapted to control the disc drive 30. The drive controller is adapted to detect whether data received through an interface 37 having a first and a second input 34, 35 has a real-time restriction or constraint. This may be detected in that a read/write instruction is received through the first input 34 from a first access means, such as a first drive letter (e.g. D:) 40 of a computer 41, to which the disc drive 30 is connected. When it is detected that a read/write instruction relating to the first type of data, such as an instruction received from the first drive-letter, the read/write means 31 is directed to the first storing area 10. Alternatively, the read/write instruction relates to the second type of data, e.g. the instruction is received from a second access means, such as a second drive-letter (e.g. E:) 42 of the computer 41. Then, the read/write means is directed to the second storing area 20.

The computer system 41 comprises a controller 43, such as a central processing unit (CPU) to execute computer readable instructions embodied on the hard disc. The invention is not only usable together with computer systems. It is usable together with any other device having a controller for providing instructions regarding the first and second [illegible] the disc drive 30.

area 10. The first storing area may also only be accessible from an application run by the computer. Then, the application program will have computer readable instructions, which will access the first storing area 10 of the disc 1, wherein the real-time data will automatically be read to/written from the first storing area 10.

Fig. 4 illustrates the steps to be carried out according to the method of the invention for accessing the first or the second storing areas 10, 20. In a first step 100, instructions to read data from, or write data to, the first or the second storing areas 10, 20 are received from the computer 41. Then, in step 110 it is determined whether the read/write instruction was executed by the first or the second access means of the computer 41, i.e. which type of data the instruction relates to. If the instruction relates to the first type of data, the procedure continues to step 120 wherein the first storing area 10 is accessed for reading data from, or writing data to, the disc 1. Alternatively, if the instruction relates to the second type of data the procedure continues from step 110 to step 130, wherein the second storing area 20 is accessed for reading data requiring support for defect management from, or writing such data to, the disc 1. Then, in step 140 the digital data in question may be read from, or written to, the disc 1, wherein the procedure is ended.

The present invention has been described above with reference to specific embodiments. However, other embodiments than the above described are equally possible within the scope of the appended claims, e.g. performing the above method by hardware or software.

Furthermore, the term "comprising" does not exclude other elements or steps, the terms "a" and "an" do not exclude a plurality and a single processor or other unit may fulfil the functions of several of the units or circuits recited in the claims.

The invention is only limited by the appended patent claims.

CLAIMS:

1. An optical disc (1) for storing digital data, comprising a first storing area (10) for storing a first type of digital data, and a second storing area (20) for storing a second type of digital data, each of the first and second area comprising a user data area (11, 21), wherein the first and the second storing area (10, 20) are logically independent, and wherein said first storing area has reading/writing capabilities for high speed data without defect management, and said second storing area (20) has reading/writing capabilities for data requiring defect management support, and comprises at least one defect management area (22a, 22b) associated with said user data area (21) of the second storing area (20) for storing defect management data.

2. The optical disc according to claim 1, wherein the first type of data is real time audio/video data incompatible with defect management, and the second type of data is digital data requiring defect management support.

3. The optical disc according to claim 1, wherein each of the first and the second area has a logical zero, or its own address space.

4. The optical disc according to claim 1, wherein the first and second areas of the disc are independently accessible.

5. The optical disc according to claim 1, wherein the first and the second storing areas are predetermined.

6. The optical disc according to claim 5, wherein the first and second storing areas are alterable during use.

7. The optical disc according to claim 1, wherein the disc has a nominal data transfer rate of 36 Mbps.

8. A method for reading digital data from, or writing digital data to, an optical disc comprising a first storing area (10) for storing a first type of digital data, and a second storing area (20), which is logically independent of the first storing area (10), for storing a second type of digital data requiring support for defect management, each of the first and second area comprising a user-data area, comprising the steps of:

- accessing the first storing area (19) when digital data of the first type are to be read from, or written to, the first storing area,
- accessing the second storing area (20) when digital data of the second type are to be read from, or written to, the second storing area.

9. An optical disc drive (30) comprising an optical reader/writer (31), a drive controller (33), means for receiving digital data (34, 35), and means for receiving (36) an optical disc, wherein the drive controller comprises:

- first access means for accessing a first storing area (10) of an optical disc (1) received in the means for receiving the optical disc in response to receiving instructions to read a first type of data from, or write data of the first type to, the first storing area (10); and
- second access means for accessing a second storing area (20) of the optical disc (1) in response to receiving instructions to read a second type of data from, or write data of the second type to, the second storing area (20), the second type of data requiring support for defect management.

10. A computer system comprising a disc drive according to claim 9.

11. A computer program product embodied on a computer readable medium comprising computer readable instructions to carry out the method according to claim 7 when executed by said computer.

ABSTRACT:

An optical disc (1) for storing digital data, comprising a first storing area (10) for storing a first type of digital data, and a second storing area (20) for storing a second type of digital data. Each of the first and second area comprises a user-data area (11, 21). Furthermore, the storing areas (10, 20) are logically independent. The second storing area (20) has a defect management area (22a, 22b) associated with the user-data area (21) of the second storing area (20) for storing defect management data.

Fig. 1

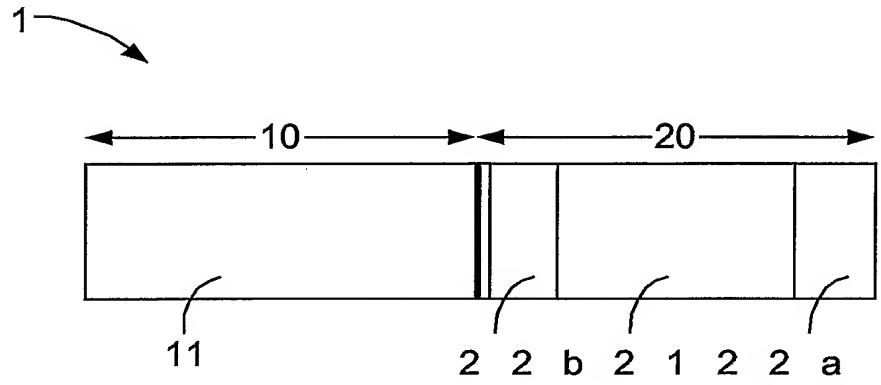

Fig. 1

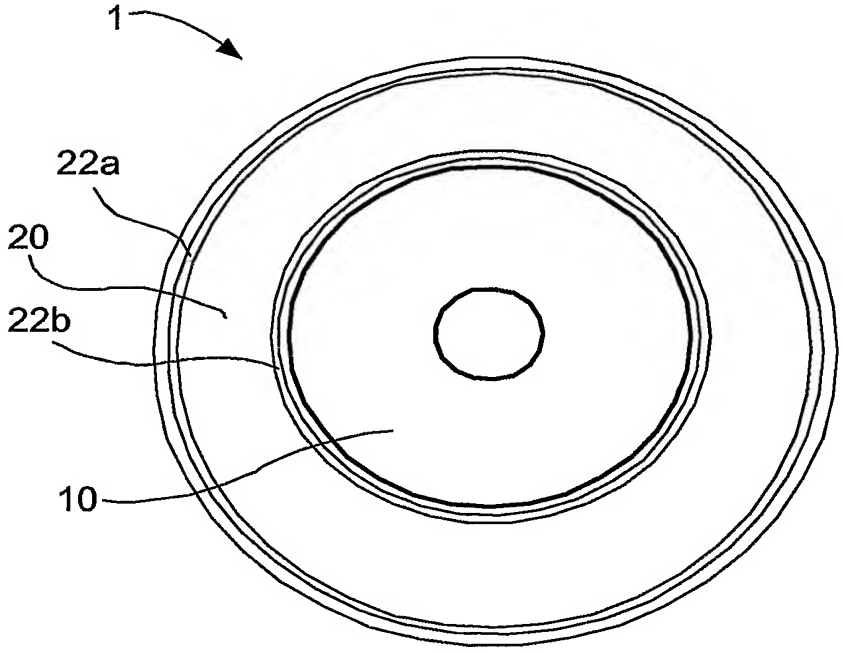

Fig. 2

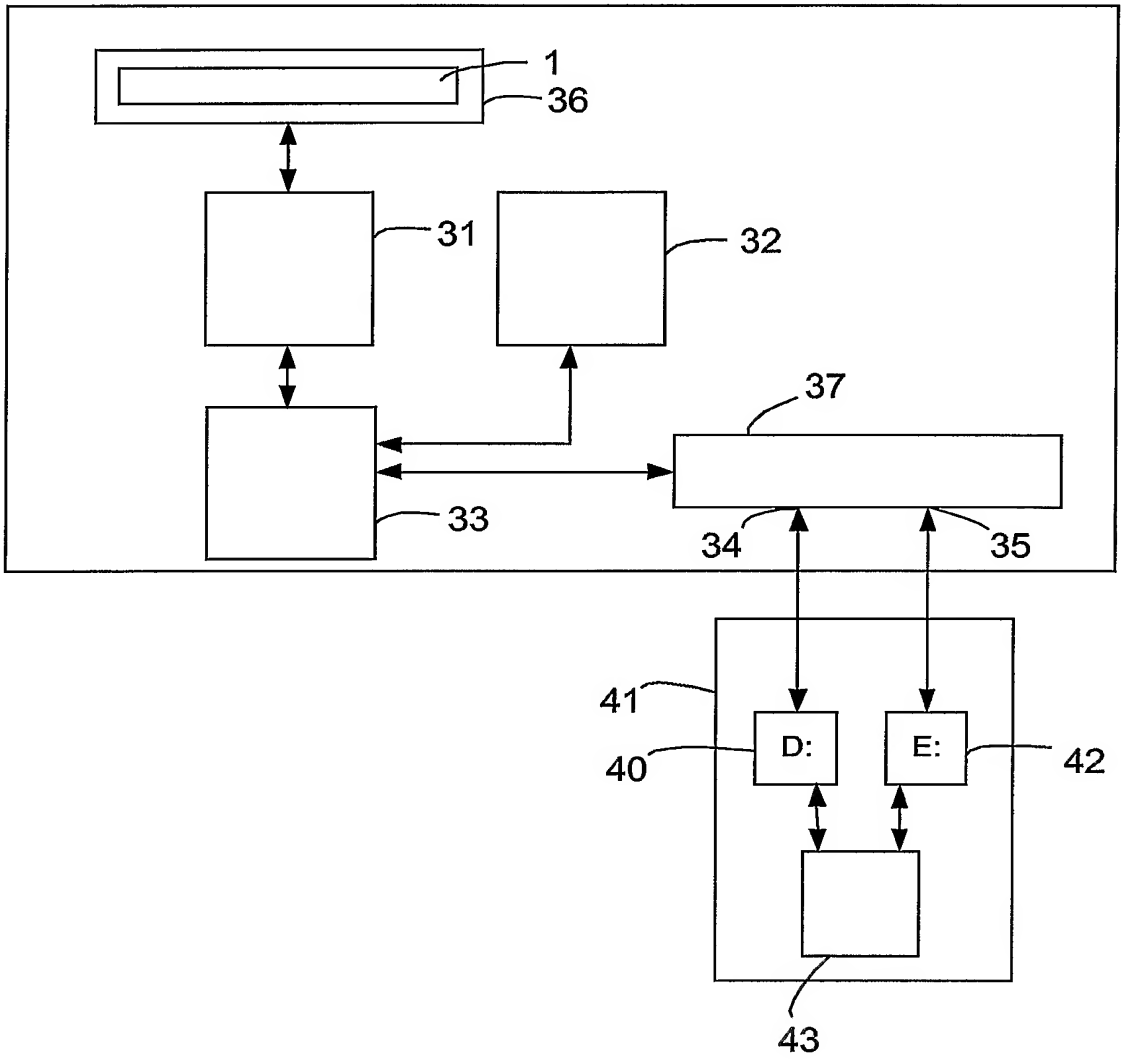

Fig 3

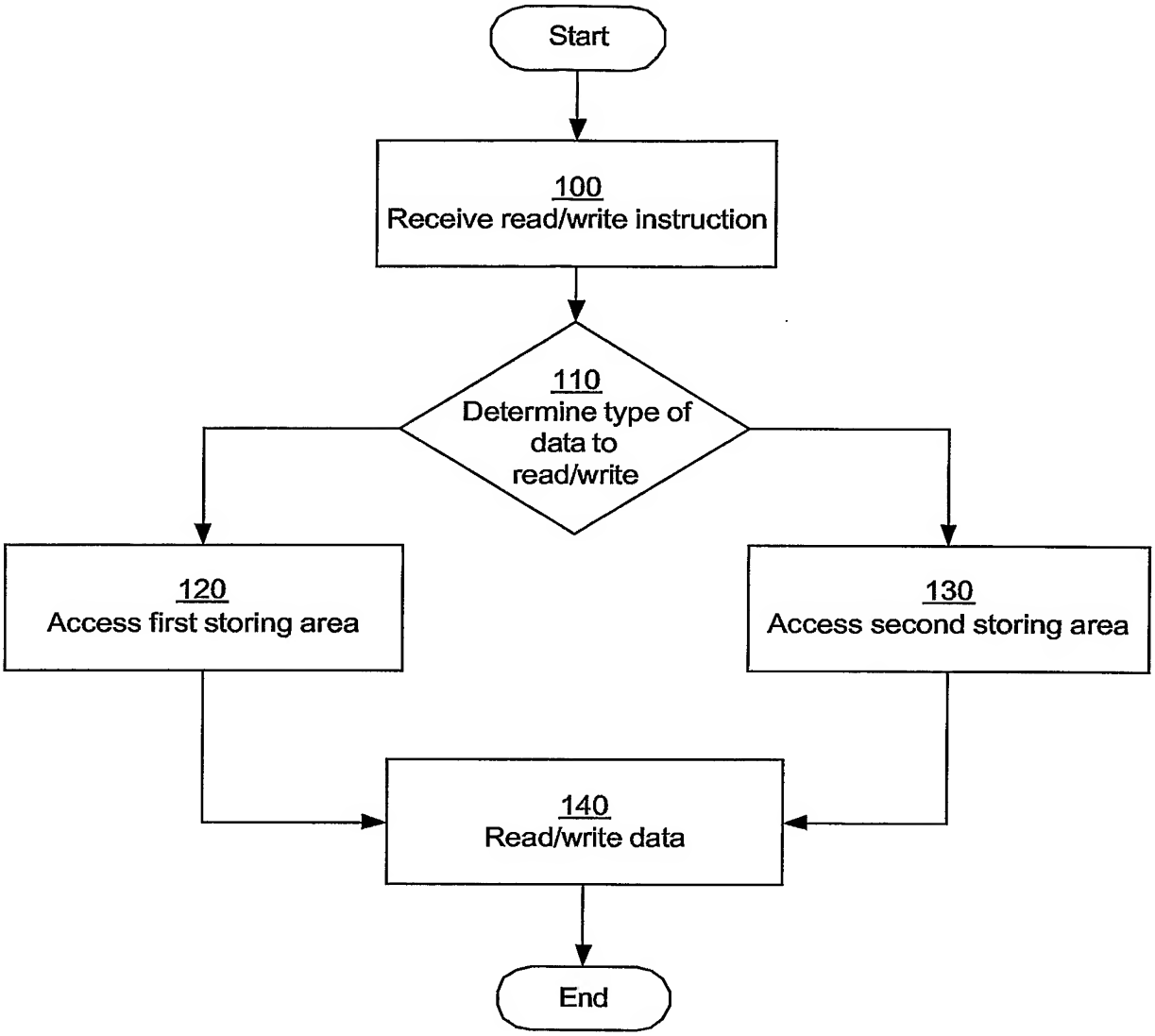
Start
100
Receive read/write instruction
110
Determine type of data to read/write
120
Access first storing area
130
Access second storing area
140
Read/write data
End

Fig. 4